# THE MATH PROBLEM

## Removing the Math Barrier to College Completion

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## Executive Summary

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# Introduction

**Mathematics education in the United States is at a crisis level. In California and across the nation, students are entering college with individual math proficiency deficits that must be more effectively addressed. Resolution is essential in order for students to succeed in higher education, complete their degrees, and successfully compete in the modern job market.**

The traditional method of placement tests and remedial or developmental math courses have failed to effectively resolve this math problem, and has severely handicapped many students from continuing in higher education pathways. Data clearly shows that the problem has disproportionately impacted under-represented minority student populations in particular.

A number of states, led by bold actions in California, have abolished placement tests and eliminated pre-requisite developmental math courses, either by legislative mandate or by executive order. In their place, multiple measures of prior learning are being used to place students in college-level math courses wherever possible. While this method is far more socially equitable, individual math proficiency deficits continue to persist.

To better understand this challenge and survey the experimentation occurring within community colleges and universities, the Precision Institute of National University commissioned a report to codify how the California Community Colleges and the California State University Systems are proceeding after having abolished placement tests and non-credit, pre-requisite developmental math programs because of AB 705 and EO 1110.

In the resulting report, *The Math Problem,* noted education writer Richard Lee Colvin examines the need to move from placement tests and traditional developmental education to evidence- based strategies that actually support meaningful student success. Colvin was the executive director of the Hechinger Institute on Education and the Media at Columbia University and was the Managing Writer at the U.S. Department of Education.

National University and our nonprofit research partner, the National Laboratory for Education Transformation, welcome further dialog and collaboration on these important issues and invite comments on this report and on the issues it highlights.

This report can be found online at www.MathProblem.org and comments can be forwarded to Info@nlet.org.

**David Andrews,** President, National University
**Gordon Freedman,** President, National Laboratory for Education Transformation

# Executive Summary

Global economic competition and the growing importance of advanced technologies across sectors of the economy ranging from communications and manufacturing to retail and transportation, coupled with the aging of the Baby Boomer generation and an increasingly diverse workforce, are intensifying the pressure on institutions of higher education in California and nationally to solve a longstanding problem: produce more graduates, even as non-traditional students account for a greater proportion of enrollments that are shrinking.

Currently, about 48% of working age Americans hold an industry-recognized credential, a certificate of work-related knowledge or skills, or an associate's degree or higher.[1] That percentage is 10 points higher than it was in 2008, before the beginning of the Great Recession. However, given current workforce trends, that figure needs to rise to at least 60% by 2025 to keep up with demand. The Lumina Foundation estimates that the nation needs to award 16.4 million postsecondary degrees or credentials to reach that goal by 2025.

Working adults in California as a whole are slightly more likely than the national average to have earned those credentials or degrees. However, the Public Policy Institute of California reports that, by 2030, California will have 1.1 million fewer baccalaureate degree-holders than the state economy will need.[2] PPIC estimates that 38% of the jobs in the state will require a bachelor's degree by then but projections show that only 33% of workers are expected to have one, unless the production of degree-holders increases. Areas such as San Diego, Orange, and Los Angeles counties as well as the San Francisco Bay Area are particularly affected by these shortages of highly skilled labor.

One of the ways California policymakers and educators are trying to meet the demand for more college graduates is to remove a barrier that blocks many from graduating: ineffective developmental education classes, particularly in mathematics, that bog students down and contribute to their decisions to drop out of school.

In response to the mounting evidence of the ineffectiveness of developmental courses nationally more than 20 states are working to reform or even eliminate those classes entirely. Florida, Virginia, Connecticut, Texas, Kentucky and, most recently, California, now have policies designed to limit or do away with such courses.

Tragically, studies have found that many students do not even need the classes. One study found that at least half of students required to take developmental classes could, given the opportunity, pass a college-level algebra class.[3]

In California, only one in four students who were placed in developmental education classes were passing.[4] Students of color fared even worse. Only 2% of Latino students and 1% of African American students who started out in the lowest level of developmental education classes eventually passed a college math class.

Community Colleges and California State University campuses are moving quickly to develop new support strategies, supports that can take many forms: providing students with just-in-time help with a particular skill by either the professor or embedded tutors; requiring students to enroll in a companion support course that gives students extra time and attention to get up to speed; providing one-on-one or group tutoring; or connecting students to online platforms that use artificial intelligence to infer what content and in what format will be most helpful to students.

**This report uses terms such as developmental education and remedial interchangeably as the general population and media often do. However, there are distinct differences. Developmental Education encompasses much more than just pre-collegiate courses. It includes supporting students through instructional strategies, counseling, advising, tutoring and study skills. Remedial courses are courses that are pre-transfer level, generally in mathematics and English reading and writing, and cover the same content that students previously had in their high school courses. In essence, the students are repeating classes that they have often already taken. Foundational courses include the remedial courses as well as some developmental education strategies. In addition, the content of remedial courses is foundational if students have not taken those courses in high school. While courses traditionally termed remedial are being phased out, other developmental strategies described above are very much still being used to support students.**

# Removal of Developmental Mathematics in CA

In 2017, Timothy P. White, the Chancellor of the California State University, issued Executive Order 1110, ending the use of placement tests for entering freshmen and eliminating non-credit developmental mathematics and written communications classes across the 23-campus system by Fall 2018. The order was framed as part of a broader CSU effort to increase its four-year graduation rate from 19% to 40%. The stated goal of the directive was to give all students, regardless of their previous educational experiences, the opportunity to finish their graduation requirements in math and composition during their freshmen year.

A month later, the California Legislature passed, and Gov. Jerry Brown signed AB 705, which went into full effect in Fall 2019. The legislation required the 114 California community colleges to make significant changes to how students are placed in math and English classes, eliminate developmental classes as requirements, and find ways to better support for students not ready for college-level classes.

The legislation and the Executive Order set in motion a rapid redesign of courses, curricula and majors as well as decisions about staffing, advising, scheduling and how best to support students. The result is that many more students are enrolling directly in college-level classes and colleges are working in a variety of ways to help them polish their skills, refresh their knowledge, and keep up with their classmates. That support can take many forms: providing students with just-in-time help with a particular skill by either the professor or embedded tutors; requiring students to enroll in a companion support course that gives students extra time and attention to get up to speed; providing one-on-one or group tutoring by a graduate student or advanced undergraduates; or connecting students to online platforms that use artificial intelligence to infer what content and in what format will be most helpful to students.

It is too early to say how these new structures are working. The CSU policy went into effect in the fall of 2018 and the results of the first semester under the new policy were positive. In both the fall of 2017 and the fall of 2018, about 17,500 students were deemed to be in need of academic support. In 2017, only about 1,400 of those students enrolled in a college-level math class; in 2018, almost 12,000 students did so. In 2017, only about 950 students passed a for-credit math class, moving them a step toward graduation. A year later, almost 8,000 achieved that milestone.

Many California community colleges began implementing the changes AB 705 called for even before it was due to be fully in effect. As part of the Multiple Measures Assessment Project, funded by the Chancellor's Office of the California Community Colleges, more than 90 colleges had been working for years on moving away from using a single placement test for assessing student readiness for college level and developmental courses, and instead using high school GPA and other course taking data to place students. This shift had already produced impressive results and required colleges to re-evaluate their math pathways and course offerings. According to an analysis by the RP Group, the percentage of students enrolling in transfer-level classes has more than doubled in writing and math classes at a sample of almost half the state's 115 community colleges.

# Reaction by the CSU and Community Colleges

**Although outcomes were positive, the CSU and community college systems acknowledge the results were uneven, but they also expect results to improve even more as colleges refine and revise their initial response to the Executive Order and the legislation.**

But many faculty members at CSU campuses and community colleges remain skeptical and fear the policies will do more harm than good. They worry about classes being watered down, especially in the community college system, where a portion of state funding is based on pass rates. They say the financial incentive to pass students will cause instructors and administrators to lower their standards. They also are concerned about the students who will still fail the redesigned classes, even with extra help. Where will they turn if all developmental education classes are eliminated? Finally, there is concern that these policies will not help students who are most likely to leave college without a degree, especially students of color, or that they will be directed disproportionately into less math-intensive fields that are less likely to lead to lucrative careers.

On the other hand, most faculty members interviewed acknowledged that developmental education was not working on most campuses as they were currently being taught and that it was time for other solutions to be tested. AB 705 and Executive Order 1110, both ambitious, sweeping, top-down policy directives, create the conditions for a grand experiment. Although reforms to developmental education seem to be succeeding, the evidence of how best to design co-requisite courses for different student populations and different educational and institutional contexts is limited.

Essentially, what these policies are calling for is change across every function and service of the campus—away from a view of higher education as a privilege reserved for the elite and toward a perspective that is more inclusive and recognizes the value of a degree or credential not just to the individual but to communities, states, and the nation.

Interviews with educators at community colleges and CSU campuses across the state reveal the enormous effort a cultural change of this magnitude entails, and the resource, campus governance, institutional organization, instructional quality, academic freedom, and technology issues it raises.

It will take sustained investments and an ongoing commitment to learning from these nascent efforts and helping them spread if they are to have a significant impact on student success.

For this to occur, campuses will need to quickly gather and share data on their students and the effectiveness of their policies and be willing to make revisions as soon as they are indicated. Faculty and staff must be central to the success of these policies and campus as well as system leaders will need to create opportunities for faculty members to learn more about how their peers are approaching these challenges. Ideally, that will facilitate a process of continuous improvement. Increasing the number of Americans earning valuable credentials or degrees is a "hard problem, one that is worthy of sustained, iterative, and reflective policy investment at the state and local level."[5]

**"Readiness [to do college-level math] has to do with students' level of understanding and also their desire and motivation to address their misconceptions, re-engage in the content, and use and apply new, correct understandings, and those are things that need to be considered as the state thinks about how to support students."—Kim Samaniego, Math Diagnostic Testing Project, University of California, San Diego**

The purpose of this paper is to support that process, in San Diego and across California, by gathering information on the initial implementation of these policies.

## Recommendations and Reflections

**Summary of recommendations from the field:**

- Define success appropriately. AB 705 considers "throughput," which means the number of students passing a transfer-level course, as a key indicator. That number is considered to be so consequential that 20% of community colleges' state funding is based on the pass rate in these courses. However, passing a course does not necessarily equate to learning the material well enough to pass subsequent math courses along with non-math courses having a math or statistics prerequisite, such as upper division psychology, nursing, and economic courses. It is important, therefore, to identify relevant, appropriate assessments that measure actual learning and can be compared across departments and campuses. Data are especially important for monitoring how well different groups of students are being served by these new approaches, ensuring that equity gaps are shrinking, not being made worse. Co-requisite classes and redesigned math pathways will undoubtedly help more students reach their educational goals. It is critical, however, to not merely accept those results in the aggregate. It is critical to ask who is benefiting from these policies and practices and who is not.
- Data also should be gathered, analyzed and distributed to highlight programs that are succeeding. Both the CSU and community college systems should find ways to facilitate the sharing of knowledge among their campuses through convenings, online discussions and opportunities for faculty and other campus personnel to travel to learn from colleagues in other parts of the state.

- Both community colleges and the CSU system are offering professional development and mentoring opportunities to help their faculty members adapt their teaching methods to serve a broader range of students. But much more professional development is still needed and should be provided as well for counselors, academic advisers, and other support staff.[6]

- Community colleges reported that they will refer students needing more support to tutoring centers, hire "embedded" tutors who will help students and provide feedback to instructors, establish "early alert" systems to help instructors identify students falling behind, and provide more student counseling and advising. But colleges say they need more funding to pay for those services. Campus administrators should identify sources of new funding or reallocate existing resources to meet students' needs. The Chancellor's office should also identify funds it can reallocate or advocate for more funding from the state Legislature to support the changes in practice required by AB 705.

- The CSU system also should ensure that its campuses are providing funds to fully implement the executive order. Relevant and aligned support is necessary for co-requisite courses to serve the needs of students who might previously have been placed in developmental education classes. As of now, several CSU campuses reported that those support courses are being led by more advanced undergraduates rather than by either faculty or adjunct instructors. If helping more students pass is considered a high priority, then colleges will need to not only staff these classes with faculty members, they'll also need to provide them with professional development opportunities or qualified graduate students.

- Campuses must reallocate resources to be sure they are offering enough sections of transfer- level courses to meet the demand not just for students pursuing STEM fields but also statistics and quantitative reasoning.

- The CSU and community college systems, as well as the campuses themselves, must also find ways to deal forthrightly with faculty apprehension about or even hostility toward these new policies. One researcher reported that some faculty believed the new policies were "just a shortcut to pass along underprepared students."[7] Another faculty member commented that students who don't at least pass intermediate algebra should not be allowed to earn a degree. Campus and system leaders need to be willing to engage critics of the reforms, solicit their ideas and suggestions, and share data to foster healthy, productive discussions.

- It is critical that state, system, and campus leaders frame these reforms as a statewide effort, even as the policies are implemented on individual campuses. Given the size of the state, and the challenges of convening leaders from across the state in one place, it would be helpful to form regional consortia of CSU, community college, University of California, private non-profit institutions, K-12 educators, subject matter experts and business leaders to establish performance goals, identify roles and functions, share results, communicate expectations, conduct research, and monitor progress.
- Partnerships between UCs, CSUs, CCs, and private universities, such as National University, also are important for sharing expectations as well as techniques and, possibly, specific technologies. Intersegmental rivalries are unproductive. It may be, for example, that some math classes are better taught at CCs, where sections are smaller. Transfer rules need to be clarified.
- Advisers need to be fully briefed on the new placement guidelines as well as the tradeoffs for students who will have more discretion in deciding which classes to take. Some students, for example, will avoid options they think will be more difficult but that will also not help them make progress toward their educational goals.
- Faculty from non-mathematics department also need to be involved in decisions about curriculum and expectations. Economics professors, for example, may think that newly designed courses do not provide students with the math knowledge and skills students will need to succeed in that field. They may respond by adding an additional math course specific to economics, which would defeat the purpose of accelerating students' progress that is the goal of redesigned math sequences. Institutions of higher learning are complex social organizations and strong leadership is needed to make sure all of a campus's assets are fully leveraged in this important pursuit.

Removing one of the barriers to student graduation by eliminating standalone developmental education classes is an important step. But it is only one element of what must become a comprehensive agenda for improving student learning and completion rates. All institutions of higher education in the state, including private colleges, must dedicate their efforts to the cause.

# Author Biography

## Richard Lee Colvin

Richard Lee Colvin is a Georgia-based speechwriter, editor, and communications consultant specializing in education at all levels. Recent clients include National University in San Diego, the Aspen Institute, Achieve, the Asia Society, Teach for America, the Wallace Foundation, the Gates Foundation and many others.

Previously, Colvin was the managing writer for the U.S. Department of Education in Washington, D.C. under Secretary John B. King. In 2009, as executive director of the Hechinger Institute on Education and the Media at Columbia University, Colvin created the award-winning Hechinger Report, which deploys a team of journalists to cover education for a variety of publications and online sites.

From 2002 through 2011 Colvin led non-profit organizations dedicated to improving journalism about education and clearly communicating complex ideas about education policy to broad audiences. From 1989 until 2002 Colvin was a reporter at the Los Angeles Times, concentrating for most of that time on education in California as well as nationally and internationally. In that role, Colvin reported extensively on mathematics instruction, curricula, and research. He has published widely and authored the 2013 "Tilting the Windmills: School Reform, San Diego, and America's Race to Reform Public Education" published by Harvard Education Press.

He is a 1976 graduate of Oberlin College and earned a master's degree in journalism at the University of Michigan.